He looked around with a beaming smile, which was at once benevolent and paternal. Bessie introduced him to Gwyn. He shook hands with him cordially with some warm words of welcome, and then, catching sight of Kane, advanced toward him.

"Mr. Hellville—ah—Hellmuth, sure it's glad I am to see ye here! It's sorry I was the last time I saw ye that ye had to make yer ajieus before the evening had begun. I hope we may be able to-night to pass the time in a more shuitable manner."

Saying this, he shook hands with Kane very warmly, and went on to chat with Gwyn, and Bessie, and Inez, one by one, in the easiest and pleasantest way in the world.

"There's no one going that knows Rome better than I do," said he, in reply to some remark of Bessie's about their journey. "Don't I know it? Haven't I lived there, off and on, for years? Meself has. There isn't a cyardinal of the holy conclave that I don't know, in and out. And they're a fine body of min intirely, so they are, but it's a pity they're so many of thim Italians. In a constichutional kingdom, as Italy now is, there's a wonderful chance for the holy father, if he only knowed how to avail himself of it. If they only wint to work the way they do in Ireland and America, they could howld the distinies of Italy and of the wurruld in the hollows of their hands. But they don't comprihind, and they won't, till another gineration comes along that grows into the new order of things. Ye see, what I always tell them is this: Ye must conforrum more to the spirit of the age. It's a liberal age and a constichutional age. Ye must be liberal and constichutional. It's no use excommunicating kings and imperors, and prime ministers and sinators. Look at the way they do in America. They take possession of the ballot-box, and thus become shupreme. Go, says I, into politics, bald-headed! Direct the votes of the people. They're all yours. Out of twinty millions of Italians how many d'ye think ye have on yer own side? There's tin million famales. Out of the other tin million min five million are boys who are all under the control of their mothers. Out of the remaining five million adult min four million are adult pisints, altogether under the control of the priesthood, and riddy to vote as they suggist. It is a great allowance to suppose a single million as belonging to the Antipapal or Liberal party. If ye wint among these, ye'd find numerous ways of gaining control of three-quarters of thim. Me own opinion is that, out of the twinty millions of Italians, there's only two hundred thousand min who can be called Liberals. And what could they do? Get universal suffrage and the ballot-box, and ye'd swamp thim, so ye would. Ye howld the distinies of the country in yer power, and all ye've got to do is, like children of Israel at the Red Sea, whin Moses came to thim as I do to you and said, as I now say, 'Go forward;' or, like the same, when Joshua the son of Nun said to them, 'Behold the promised land! Go ye up and possess it!'"

From such high themes as these the conversation gradually faded away—Gwyn absorbing Bessie, and Kevin Magrath alternately addressing Inez and Kane. But Inez evidently took no interest in what she considered politics, and thus Kane was left as the only collocutor or listener or whatever else he may have been. Collocutor he certainly was not, however, for he simply listened, not attending particularly to Kevin Magrath's remarks, but rather thinking about the best way of seeing him alone, so as to ask him about those things which now were uppermost in his mind. At length Inez left the room. Gwyn and Bessie were taken up with each other, and then it was that Kane made known his feelings.

"I should like very much," said he, "to ask you about some things that are of importance to me. Can I see you alone for a few moments?"

Kevin Magrath smiled graciously.

"With the greatest plisure in life," said he. "Come along with me to me own room, and we'll make a night of it."

With these words he rose and led the way along the corridor to a room at the end of it. Entering this, Kane found himself in a large and elegantly-furnished apartment, opening into a bedroom. On a sideboard were bottles, decanters, and tobacco-boxes. On the table was a meerschaum-pipe, a box of cigars, and the latest *Galignani.*

Kevin Magrath rolled up an easy-chair beside the table.

"Make yerself comfortable," said he, cheerily. "Ye'll take something warrum, won't ye—and a pipe or so? I've whiskey here by me, Scotch or Irish—'Cœlum non animum mutant,' ye know; 'qui trans mare currunt;' and, for my part, I carry a bottle of Irish whiskey with me wherever I go—and Scotch too, for that matter; though, on the whole, I object to Scotch whiskey, for it savors somewhat of Calvinism. Howandiver, ye'll take one or the other."

Kane mildly suggested Irish.

Kevin Magrath smiled.

"It's charrumed I am with yer taste, and I take it as a complimint to me country," and he poured out a wineglassful, which he handed to Kane, after which he poured out another for himself. "Here," said he, "lifting it to his lips, "here is a libation which I've powered out in honor of old Ireland, let's drink to the first flower of the earth and first gim of the sea."

They both drank solemnly.

"And now," said Kevin Magrath, "having performed the first juties of hospitality, I'm altogether at your service. But won't ye take a pipe or a cigar?"

Kane declined.

"The fact is," said he, drawing a long breath, "my name is not Hellmuth."

"The divil it isn't!" said Kevin Magrath.

"Circumstances," said Kane, "made it necessary for me on my former visit to take that name. At present there is no such necessity. I have dropped it, and have taken my own again."

"'Deed, thin," said Kevin Magrath, "I hope that yer circumstances, whativer they are, have changed for the better."

Kane sighed, and regarded the other gloomily and fixedly.

"My name," said he, is a familiar one to you. It is Kane Ruthven. I am the man that married Clara Mordaunt, and caused her death. I wish to talk to you about her. I wish also to show you that, for any evil which I did to her whom I loved, I have atoned for by life-long remorse."

At the first mention of this name a sudden and astonishing change came over Kevin Magrath. His easy, placid smile passed away, a dark frown came over his brows, he pushed his chair back and started to his feet, and regarded Kane with a black, scowling face.

"You!" he cried.

"Yes," said Kane.

Kevin Magrath looked at him for some time with the same expression, but gradually the severity of his features began to relax.

"I've prayed," said he, slowly, "and I've longed for the time to come whin I could see ye face to face; and thin again I've longed and I've prayed that I might never see ye. I've prayed to see ye that I might have vengince for Clara's bitter wrongs, for her betrayal, for her broken heart, for her death, for the dishonor of a noble name, and the shame of a lofty lineage; and I've prayed not to see ye, so that I might niver have another man's blood on my hands, for I felt sure that, if I ever did see ye, that momint I'd have yer heart's-blood. But, somehow," continued he, after a moment's pause, "somehow—now that I do see ye face to face—sure, I don't know how it is at all at all, but the desire for bloody vingince has gone out of me; and ye seem to have the face of a man that's paid the full pinalty already of any wrong ye've iver done, so ye do. And whither it is this that's the matther, or whither it is that I can't rise against the man that's drunk with me—but sure to glory I'm changed—and so I say to you, Kane Ruthven, in the name of God, what is it that ye seek me for, and have ye any thing to say for yerself in regyard to yer dealings with the young gyerrul that ye—destroyed?"

Kevin Magrath's manner was most impressive. It was that of a lofty, rigid, impartial judge, who will exact strict justice, yet is not altogether disinclined to mercy. Kane sustained his gaze with tranquillity, and looked at him with a solemn, sombre brow. When he had finished, he said:

"You are mistaken about me in many ways, and, when you hear what I have to say, you will have a less harsh opinion of me than the one you expressed in London."

"Go on, then; let me hear what you have to say, for it's meself that would be the proud man if ye could clear yerself of any of the guilt that's seemed to be attached to ye."

Kane now proceeded to tell his whole story. He told it frankly and fully, heaping blame upon himself lavishly, yet clearing himself of all those worse charges which Magrath had uttered against him.

After it was over, Magrath remained musing for a long time.

"Sure," said he, at last, "there was villany, though not with you. Your brother was hard, but it was my poor frind Hennigar Wyverne that was the arch-traitor and rogue. But how in the worruld did it happen that Clara did not know herself that she was the daughter of Bernal Mordaunt, and heiress of Mordaunt Manor?"

"I can't account for it at all."

"I've heard it stated on iminint authority," said Magrath, "that a boy who leaves his home, or is taken from his home, at the age of tin, and is thrown into a foreign land among strangers, will in five years forget his own name, his father's name, and his native language. I nivir believed it before, but now this looks like it. Clara lost her home and her father at tin; she had not lived regularly at Mordaunt Manor either, and was sent into France; and thus it has happened that she forgot in a few years the most important things."

"It must have been so," said Kane. "She knew her name, but had no recollection of Mordaunt Manor—at least she said nothing about it—and she certainly had no idea that she was an heiress."

Another long silence followed.

"Kane Ruthven," said Magrath, at last—"or perhaps I ought to say Sir Kane—what you have said clears you completely and utterly from the suspicions which I had forrumed about you. You have not been guilty, as I now see, of any thing worse than carelessness, or thoughtlessness. For that you have suffered enough. I must say that me conscience condimns shuicide, and in that act ye were clearly wrong; it was unnecessary; she would have drifted home or into my hands, for I was close upon her track at that very time. Howandiver, what's done can't be undone, and, as ye're an innocint and a suffering man, why—there's my hand."

With this he reached out his hand. Kane took it, and Magrath shook it heartily.

"I have understood," said Kane, anxiously and hesitatingly, "that—that she—she was removed from the cemetery."

"It was her father's wish," said Magrath, "that she should be buried beside her mother in Rome."

"She is now in Rome, then?"

"Yes, with her mother; and the other two daughters, Inez and Bessie, are going to pray over the graves for the repose of the souls of their mother and their sister."

"I should think that they would have been taken rather to Mordaunt Manor."

"It was Bernal Mordaunt's doing," said Magrath. "But they are all united, for Bessie's filial piety has accomplished one of the last wishes of her father; and, while she was living at Ruthven Towers, her father's remains were exhumed and taken to Rome."

Kane hardly heard these last words. His mind was occupied exclusively with thoughts of Clara. Magrath's information was conclusive. It was what he had wished to know, and there was nothing more to be learned. About the affairs of Inez he thought no more. She was safe now with loving friends; the mysterious circumstances about her late imprisonment were no doubt satisfactorily explained, and he himself had no further interest in the matter.

It was with a feeling of satisfaction, however, that Kane reflected on the formal acquittal which Magrath had given him of evil acts. For Magrath was now to him a stern, a just, and a wise judge, from whom a declaration of this sort was valuable, indeed. There was at the conclusion of this interview a deeper solemnity than usual in the manner of each of them, and Magrath did not press him to stay, or ask him again to take a drink.

That night Gwyn bade Bessie farewell. She was to start with Inez early on the following morning for Rome.

"You'll come on soon, Gwynnie darling," said she, tenderly.

"Immediately, of course, Bessie dearest."

"And you'll bring dear Kane?"

"Of course."

Bessie looked at him earnestly.

"We're beggars now, so we are, Gwynnie dear, but I love you, and we can be as happy in our poverty as ever we were in our wealth, so we can."

Gwyn pressed her to his heart and left.

As he walked away, his heart was full of bitterness. Kane and Inez seemed now like interlopers, who had come between him and his darling, casting her down from the wealth and luxury with which he had thought he had endowed her. Kane again had been the innocent cause of this foul wrong which he had done his wife, and Inez came forward as her supplanter in Mordaunt Manor, and also as in some sort a rival to himself, since she had drawn Bessie away from him.

All these things filled his heart with bitterness, and with these feelings he sought Kane's apartments that night.

[TO BE CONTINUED.]

BIRDS' WINGS.

PHILOSOPHY OF FLYING.

Our readers have often observed the flight of birds, if not like Romulus and Remus in fabled history to gather divination therefrom, at least to admire one of the beauties of animated Nature. Doubtless, they have watched with delight the hopping of the sparrow from twig to twig, the heavy flapping of the crow over the cornfield, the steady march of the wild-pigeons in countless numbers to the forest, the rapid raid of the swallow joyfully whirling about in the sunshine, the coursing of the night-hawk through the evening air; they have admired the magnificent sailing of the kite floating high up in endless gyrations, exhibiting the very poetry of motion, or they have wondered with Solomon at the "way of the eagle in the air," soaring to the eyrie in the rock. They have heard repeatedly that all the works of the Creator evince design, but very likely they have never studied the bird's wing in connection with the question of adaptation of means to an end as exhibited in that organ. They know that wings are necessary to the act of flying. Angels are depicted with wings; not only fat little angels upon tombstones, but cherubim and seraphim. The Bible even speaks in figure of the wind having wings. The classical reader will recollect how Dædalus made wings of feathers and wax for himself and his son Icarus, and how the latter fell into the sea and perpetuated his name through his misfortune. Every lover of Italian remembers Tasso's exquisite description of the celestial messenger Gabriel, and the balancing of his wings upon Mount Libanus before he darted down into the camp of Godfrey de Bouillon. Wherever there is any flying to be done, we read of wings.

Solomon "spake of fowl," but, as his work on natural history has not come down to us, we cannot say whether he solved the mystery of flying. We incline to think, however, as he wondered at "the way of the eagle in the air," that his wisdom did not attain to the point in question. In fact, it is only of late years that some of the delusions which have existed in regard to flying have been exposed, and the "way of the eagle in the air" has been fairly demonstrated.

The former Duke of Argyll, a man of retired habits, but much interested in mechanics and the application of practical science, attracted by the motion of birds in the air, was induced to make an investigation of the subject, which resulted in his developing the "Theory of Flight." This theory has been further elaborated by his son, the present duke, whose devotion to philosophy and science has illustrated his order and distinguished his name. We purpose to glean from the writings of the duke the leading points connected with the "theory" referred to, and also with the aid of information from other sources to give an idea of birds' wings and explain the mechanics of flying.

It is manifest that a bird is much heavier than the atmosphere; that, when one is shot dead, it will drop to the ground, even with its wings extended, in obedience to the force of gravity. Every force is the expression of a law which never varies; it acts always and in the same way. The physical universe would become unsettled, were it not so. But every force may be compensated, and every law may be met by another law, so that resultant action is as certain as the operation of the original laws and forces. Hence, not understanding how a heavy body can swim in the air, some writers, following out a conjectural plan of compensation in forces, have put forth the hypothesis of buoyancy, assuming it to be a fact, and explanatory of the whole difficulty.

"The weight of birds," says Child, "is familiarly known to everybody. There is, in fact, no very striking difference in this respect between them and the other animals that live upon the ground, and it is obvious that mere wing-flapping alone would be insufficient to sustain them in the air, were they not aided by other means. As bones are the heaviest of the structures which enter into the composition of birds, it might naturally be expected they would offer the chief impediment to flight: and such would undoubtedly have been the case had not Nature, by a slight deviation from the general rule, converted what would have been a drawback into a source of assistance. Animals, whose movements are on the rough surface of the ground, require to have bones of great strength and density to enable them to withstand the shocks and strains to which they are liable; but birds, whose chief movements are in the air, do not require bones of such solidity. Nature, therefore, by forming them into hollow cylinders, has given them the shape which mechanically combines the greatest strength with the greatest lightness; and, after every particle of superfluous bony matter has been thus removed, the interior of the bone is generally filled with air instead of marrow, by which the weight is still further reduced. Not only does air pass freely into the bones of birds, often down to the ends of the small bones composing the toes, the tips of the wings, and even into the quills of the feathers, but, by means of a peculiar system of air-cells or receptacles, it is diffused all over the body, with an abundance which corresponds to the flight-power of the bird. These air-cells are in free communication with the air-passages of the lungs, and many of them can be inflated or emptied at will. They are of large size in the thorax and abdomen; occasionally they reach high up in the neck, forming, as it were, a balloon in front of the body, and they are, generally, very widely distributed under the skin. In birds distinguished for their power of flight, such as the solan-goose, albatross, and pelican, the air not only fills the bones, but surrounds the viscera, insinuates itself between the muscles, and buoys up the entire skin. The whole body is like an inflated balloon. The circumstance, however, which chiefly promotes buoyancy, and gives to this remarkable arrangement its lifting power, is the comparatively high temperature of the included air. Birds are warmer-blooded than mammalians; thus, while the internal temperature of man seldom exceeds 98° Fahr., that of birds varies from 106° to 112° Fahr. This higher temperature is an indispensable requirement of their great muscular energy, and it, no doubt, also helps to counteract that tendency to cold which necessarily arises from their rapid movements both in air and water. But the purpose served by this high temperature to which we now draw attention is that it acts as a furnace to heat the air within the bones and cells. In circulating round the walls of the cavities containing air, the blood imparts to the latter a portion of its own warmth, just as a service of hot-water pipes heats the air in a room round which it is carried. The heated air, of course, renders the whole bird buoyant, on the principle of a fire-balloon or caoutchouc-ball, both of which readily rise into the air on being warmed. When the weight of the bird has thus been brought more or less into equilibrium with the surrounding air, the action of the wings easily lifts it from the ground. How completely this equilibrium is sometimes attained, even in the case of very large and heavy birds, may be inferred from the fact that the gigantic condor of the Andes is occasionally seen wheeling in circles for hours together without the aid of a single flap from its wings. The perfection of buoyancy is even more wonderfully displayed by the frigate-bird of the Atlantic, which is said not only to rest its wings, but even to slumber as it floats in the air like a balloon."

We have given the above full quotation in order to show clearly what is the old-fashioned and popular view of the subject. Objections to it will readily suggest themselves to every reflecting mind. If a bird is thus charged with heated air, why does it not rise incontinently from the branch of a tree? Instead of sitting quietly on the branch, in obedience to the law of gravity, it would have to use muscular effort to stay down. A bird would hardly alight to enjoy such repose. Further, if a bird resembles a balloon or a caoutchouc-ball, it would, like them, be entirely at the mercy of the wind, which we know it is not, unless the wind be a hurricane or whirlwind; and birds are not prone to go out in hurricanes or whirlwinds any more than men, for they have a pretty good judgment in regard to the weather. When they do chance to get caught in a hurricane, they generally find themselves blown about until the wind abates, or they perish from its violence. Inventors of flying-machines have been posed hitherto by this very difficulty in regard to the wind. They can secure temporary buoyancy, but they cannot obtain either momentum to overcome the wind or find an adequate fulcrum with which to guide the air-boat. The latter rises, floats for a time, and is driven by the wind until a wreck ensues. No one has ever yet succeeded in stopping even at a castle in the air. Now, a bird breasts the storm, revels in the gale, outstrips a fierce wind, and goes whither it will; flies, floats, poises, alights—in fine, is master of itself and of the situation. Hence some other elucidation of the mystery than the old-fashioned, fallacious one must be sought. As wings are, in heaven and on earth, the organs of flight, evidently we must look for the explanation chiefly in them.

The construction of a bird is peculiar, and, like all God's work, exhibits admirable adaptation to the end intended. Its body resembles in shape the egg from which it came, set with the big end forward. Its frame is compact, the pectoral bones being nearly solid, while the long bones are hollow, and filled with air as much as possible. Thus lightness and strength are combined in the highest degree, and the external pressure of the atmosphere is compensated. Besides, the internal air-system which is elaborated in the organization of a bird, which has been set forth in the extract from Child's work, gives the bird immense lung-power. That is its purpose; and it is one of vast importance to a bird, which needs to be very long-winded and very strong, neither of which capabilities can be had without more lung-force than their unaided lungs would afford. Hence the bird is, in some sense, all lungs, and has a power proportioned to its breathing process. A pigeon will consume more air than a kitten.

The pectoral muscles are very powerful—the shoulders being kept apart and sustained by the merry-thought—and the sinews which work the wings are exceedingly tense and elastic.

The whole body is covered by the plumage, which, in birds of some size, does not exceed two or three ounces in weight, thus affording a dress which is adapted to any temperature, of which many birds experience great varieties and great extremes, as it can be opened or shut at pleasure, and, at the same time, is easy-fitting and light—important considerations to the owner who cannot, like John Gilpin, "carry weight."

The head of the bird is set upon a flexible neck, so that it can see in any direction without turning the body. The legs are attached in such wise that, when tucked up, as they always are by all good fliers when in motion, they do not take away from the egg-like shape of the body, or interfere with its general balance.

The wings, likewise, are so set that they hold the body in equilibrium. They vary in size and shape according to the character of the bird. Birds which fly little have short, round wings; birds which live in the air have very long—sometimes extending fourteen feet—narrow, sharp wings. There is every sort of wing, from the thick, puffed wing of the grouse to the ribbon of the swift. The species of the bird and its mode of life determine its peculiar organs. The main feathers of the wing are peculiar; they are those in the eagle, the swan, and the goose, out of which quills are made for writing. They are curved, and the air circulates freely through them, thus insuring their lightness and strength, as well as elasticity, for which characteristics they are remarkable. The quill, or root, is deeply and firmly embedded in the bone-frame. From the quill, or in continuation, the shaft extends to the tip of the feather, dividing it into two vanes, of which the upper is shorter and stiffer than the lower. The last-mentioned feature is worthy of special notice, as it enables the feathers to be imbricated in such a way that the shafts will lie parallel and near as possible together, thus affording the utmost strength to the armature. The impingement of the superior feathers is upward, being precisely the reverse of what one would suppose without examination. There is an important reason for this arrangement of the quill-feathers and their seconds. For instance, draw your hand down the upper surface of a wing, and you will open the imbrication; draw your hand down the under-side of the wing, and you will close it tight. The vanes are further locked by barbules, which hook their leaflets together. This compact arrangement adds to the strength of the feathers, and also causes the wing to rustle in cutting the air. Owls have no barbules, which accounts for their silent motion.

The frame of the wing is divided into three main sections—the shoulder, the forearm, or pinion, and the hand. They are so arranged that the wing can be folded close to the side, or extended more or less at pleasure.

The feathers which arm the wing vary with the section to which they are attached. The outer, upper, and main feathers, we have described. The other superior feathers are straight and equally vaned. Besides, there is a coating, or padding, of other feathers, which we need not describe particularly, as our readers have all, no doubt, often looked at birds' wings.

The tail is horizontal with the plane of the bird, though some birds have extra tail-feathers, which are variously set, as the cock, the pheasant, etc. The horizontal feathers are like the subsidiary feathers of the wings, straight and equally vaned.

The wings and tails of birds frequently differ in color from other parts of the body, and are generally marked for their variety of hue and great beauty. "The plumage has been perfected," as Child well observes, "by giving to birds, and especially to water-fowl, the power to secrete an oily matter, which, smeared over the feathers, renders them impervious to moisture. All must have observed that, when a bird is dead, and can no longer diffuse this oil over its feathers, the water soaks in, and soon spoils the plumage. The feathers are so arranged over the body of the bird that, in flying, the pressure of the air or water keeps them closely applied to the skin, so as to offer the least resistance to motion." There is an exception to the latter statement which is important, as we shall show. Too much praise, however, cannot be bestowed upon the beauty and adaptation of the plumage of the birds which God "created to fly over the face of the earth."

We have now reached a point where we can undertake to explain the philosophy of flying. Let us suppose a bird, a good flier, at rest. It determines to fly. By the muscular power of its legs it might jump up, but what is to countervail the law of gravity and keep it up when the muscular force is exhausted? An arrow will ascend until the force given by the bow is wasted, and then, obedient to the attraction of gravitation, it descends. Again: what is to give the bird momentum, so that it may overcome the resistance of the atmosphere? When a bird springs up it always lifts its wings, which move equally, in the same time and with the same power, not, like a pair of sculls in the hands of a rower, variously, evenly, or unevenly, as will may direct, but, like a pair of coupled engines, together. The upward movement of the wings opens the plexus, or imbricated feathers, the air passes through, and so the dead lift which would attend the rising action of the arched wing, were it tight, is prevented. Further, the air, as it passes through, passes down and back, depressing the flexible plumes in its course, and giving the bird, through the leverage effected, a forward motion. Then it flaps its wings down. Instantly the plexus closes, as we have illustrated by the motion of the hand on the wing, and the concave wings compress the air in their embraces. The air, which is wonderfully elastic, reacts energetically, causing the bird to ascend. In addition, as the bird slides, the air rushes out behind and up, and thus acts a second time as a lever, and forces the bird forward. The motion of the air ripping out at the ends of the feathers is familiar to every one who has observed the flight of flocks of wild-pigeons. It seems, as the flock passes, as if the feathers were being torn, and adds largely to the general rustle created by the movement of the birds through the air. Here, by two motions of the wings, rising power and momentum are obtained, and that, too, without prejudice to the self-control of the bird. Hence the bird has only to flap its wings, and up it must go and on it must go—in a word, it must fly.

When a boy wishes to make his kite ascend, he checks the string; the wind, striking the breast of the kite, passes down and out behind, and, consequently, up and forward goes the kite. A bird, too, when it finds difficulty in rising from the water, or when launched in the air from some tree, wishes to mount rapidly, turns to windward, and the flapping of its wings produces the same effect as the string of the kite, and up soars the bird, until sometimes it is almost lost to sight in the "cold, thin atmosphere," where it needs all its warming-apparatus and close-fitting dress to make it comfortable. It is with difficulty that a bird mounts flying with the wind. Generally it goes straight when accompanying or outstripping the wind, or moves in loops, rising and falling. To rise with the wind, it must make special exertion.

The wind facilitates flying in some birds. Thus people, not infrequently, as they watch the constant motion of the gull in the gale, wonder that it does not tire in the storm, while, in truth, it is the gale which is doing the work, and the gull has only to flap away at its convenience.

When a bird wishes to descend, it closes its wings, and then, by the law of gravity, it sinks, with constantly-growing rapidity, in proportion to the square of its distance from the earth. Usually a bird keeps its broadest expansion horizontal to the plane of the earth's surface, and its narrowest front forward. But it can change its lay in the air. For instance, if in a great hurry, as an eagle after its prey, or any hunting-bird, it will dive down, adding to the force of gravity by muscular exertion, like a boy in diving from a wharf into the water. Birds will often descend from great heights with frightful rapidity, then suddenly expand their wings, change their axis, recover themselves, and move off or up, as they may wish. "It is a singular fact," says Child, "that birds most remarkable for flight are sometimes no less distinguished for the ease with which they dive and glide about under water. The solan-goose, for example, which haunts the lofty heights of the Bass Rock and Ailsa Craig, is a most expert diver, as is proved by its being sometimes caught in fishing-nets that have been sunk *thirty fathoms* under water. The wings of such birds are adapted to their double purpose. A bird, however powerful by nature, unless so fitted, easily becomes helpless in the water. Hartwig tells us that the sea-eagle of the arctic regions, the foe of the auk, and the gull, and the high-swimming fish, sometimes strikes a dolphin by mistake, and is carried down to the depths forever."

Variations in flying are effected by changing the direction of the axis of the body and modulating the movements of the wings. Direction is ordinarily attained by the bird inclining its body the way it may wish to go. It goes, as a man goes, the way it wills. In rapid turning it can assist itself by depressing one side of its tail, but it never uses the tail as a rudder. Woodpeckers use the tail as a third leg, making a tripod from which to hammer; still they do not use the tail in the air except as other birds. The service which the tail renders to the bird on the wing is to facilitate it in a quick revolution, and to aid it in stopping, hovering, or floating.

If a bird is disposed to light, it slows its motion, brings its axis more nearly perpendicular to the earth, strikes its wings a little sharply up and forward, flutters, and then rests. It folds its wings, and its weight causes the fat to contract on the limb, and hold it firm and quiet. If a bird wishes to glide down, it expands and flattens its wings. If it desires to hover in the air, it performs almost the same operation that it does in alighting, except that it turns to the wind, and makes the latter serve the place of the branch.

"I have seen," says Argyll, "a kestrel stand suspended in a half-gale, with the wings folded close to the body, and with no visible muscular motion whatever." Every thing depends upon the balance of forces being maintained, and this depends upon the construction of the bird and the character of its wings. Changing the axis, shortening, lengthening, flattening, sharpening the stroke, produce necessary results of different kinds. "Birds with superabundant sustaining power and long, sharp wings have nothing to do but to diminish the length of the stroke and direct it off the perpendicular at such an angle as will bring all their forces bearing upon their body to an exact balance, and they will remain stationary at a fixed point in the air." The expanded tail assists much in the manœuvres of hovering and poising, and, indeed, it serves to stop motion forward when the bird drops its body so that the tail will be down and opposed to the wind. Very little movement will change the action and attitude of the bird from hovering or poising to flying. Frequently it is hardly apparent. "Generally it is a slight expansion of the wings, and a very slight change in the axis of the body."

Some birds have the faculty of floating or sailing in the air, like the hen-hawk, the eagle, the condor, and others. The martin and swallow glide, but do not sail in endless gyrations like some of the birds of prey. Both these movements, of which the former is superior to the latter, and may be said to include it, result from the bird having ample wings, great sustaining and propelling power. Thus, by its strength, having obtained immense momentum, it ceases to flap, and glides or sails along, exhibiting wondrous grace. It must be remembered, however, that these sailers, through their great wing-power, can sustain and propel themselves by a motion so slight that it would escape the eye, owing to their great height in the air.

The manner in which wings act may be learned by taking a pair of dried, outspread wings and flapping them in imitation of the original owner. It will be discovered that it is much easier to lift them up than to press them down, and that, as we have above described, they tend forward by the leverage of the wind.

The power with which a bird flaps can be gathered from the beating of a canary against the wires of its cage. Let any one endeavor to hold an enraged goose, and he will be quite as well satisfied with the buffets he will receive as Richard was with the one he got from the holy friar of Copmanhurst. Some of the vulture species will pounce upon the neck of an animal and stun it with blows from its wings. Von Buch says that the ox will rush away to escape the attacks of the sea-eagle, blinded and terrified by the sand it scatters in the brute's eyes and the terrible flapping it makes about its ears. A lamb, or even a small sheep, stands a poor chance against the mighty wings of the monarch of the air.

The force of the stroke a bird gives with its wings is equalled by its rapidity. A crow, which is a heavy flier, will make one hundred and fifty upward and as many downward flaps per minute. It would be vain to attempt to count the strokes of a woodcock or wild-pigeon. A humming-bird's wings almost dispear like the spokes of a wheel in rapid motion. The unweariedness and persistency with which a bird uses its wings can only be explained by its possessing great strength in proportion to its size, and having its wings endowed with sinews of singular toughness and elasticity. The raven which Noah dispatched from the Ark went forth to and fro until the waters were "dried up from off the earth." The time was about seven days. The wild-pigeon is celebrated for its long and rapid flights. The rice found in the crops of some that have been shot in the lake region proves how far and how fast they must have journeyed through the air. "In the time of Henry IV. of France," says Child, "there was a falcon which became famous in Europe by flying from Fontainebleau to Malta, thirteen hundred and fifty miles, in twenty-four hours. The man-of-war bird is sometimes found a thousand miles from shore, hunting for its food. Yet it never seems to tire, or to seek rest either on the surface of the sea or in the rigging of the ship. It is said only to seek the land on the return of the breeding-season." The migratory birds and the swallows are further examples of the endurance of birds upon the wing.

We alluded in the beginning of this article to the different modes of flying displayed by birds. The crow flaps incessantly, so does the pigeon, the sparrow, the game-bird, while the robin, the swallow, the hawk, and other varieties, exhibit every style of movement. Each species has its peculiar mode of motion through the air. Doubtless each understands the science of flying, and executes, in its own opinion, the highest feats of "wingmanship."

Such is flying. It will be observed that it all depends upon the bird, through its physical construction, obtaining a fulcrum in the air, and controlling forces by combining or equalizing them. By the use of its wings it makes the air not only compensate gravity, but gives it lifting and propelling power. It flies on the wind and through the wind. Momentum is the multiplication of weight by velocity. This force enables the bird to master the air. Again, it employs either gravity or the air, or both, to acquire direction. So, possessing all these powers, holding them in equilibrium, or exerting them indifferently, it is as much master of the air as the fish is of the water, and flies whithersoever it will.

George C. McWhorter.

THE SAP-SUCKER.

It is a matter of great surprise to me to find that so few of those who take delight in observing and studying the character and habits of birds have discovered that there is but one species of sap-sucker in the United States, at least east of the Rocky Mountain range. Three or four of our smaller woodpeckers, particularly the two varieties of the *Picus villosus*, and the pretty speckled fellow with the pale-red head, the *Picus pubescens*, so often seen in our orchards, have been named sap-suckers by ignorant people; but the true sap-sucker is a very unique and interesting bird, lonely in his habits, peculiar in appearance, and really very little like any other of the woodpecker family. He has been named *Centurus Carolinus* by the naturalists, but it seems to me that *Bacchus Americanus* would be a more appropriate title to confer on this bibulous little fellow who taps the racy veins of our trees, and complacently sips the nectar that bubbles out from the perforations his sharp beak has made.

The sap-sucker is not showy, like most of his kinsfolk, and he has a shy, quiet way of doing his limited "routine of duties" that prevents his being much seen or noticed by even a careful bird-hunter. You might spend several hours rambling in an apple-orchard where a number of sap-suckers were busy at work without seeing one. You would hear the sharp tap-a-tap of his busy beak, but the bird shrewdly manages to keep the body of a tree between you and him. He is not boring for worms or larvæ, not he! He is tending his pots of delicious sap. Observe closely, and you will see the rows above rows of small, cone-shaped cavities, encircling your finest apple-trees, that tell a bad tale of this bird. He is a sort of vampire, sucking out the life-blood of your pippin and wine-sap bearers. There he goes! What an odd flier he is! Like a sailor, "he has a rolling gait." He goes through the air as if riding on long, low billows, in the mean time uttering a shrill yet plaintive "quee-ek," unlike the cry of any other thing. This viscid wine he has been swilling has no doubt had something to do with making him flit so crazily. Poor bird, he will die of *delirium tremens!*

If you will hide near the tree he has been tapping, he will soon come back to his goblets, now overflowing with sweet, thick sap. At first he approaches slowly, flying from tree to tree, till at length he lights in the top of the one you are watching, and begins to descend, *tail foremost*, turning his head rapidly from one side to the other. Finally, emboldened by the silence round about, and seeing no enemy, he drops down to his *beakers* (no pun), and begins to drink in a way that tells you how greedy a toper he is. When he has emptied all the pits, he at once proceeds to peck new ones, continuing steadily to labor till the sap has refilled those first emptied, then he drinks again, thus alternately working and feasting till, grown full and tired, he muffles his head in the feathers of his shoulders, and sits quite still, as if drowsily and dreamily enjoying the gentle wind that flows round him, laden with the sweets of Indian summer.

You may now study his features. His back has a light-brownish stripe down it from neck to tail. His wings are dark, flecked with white and greenish brown. His head is striped with dull white and dingy black, a barely perceptible spot of red shining on the occiput, and his breast is cloudy white, running into brownish red near the throat and tail. His beak is rather shorter than those of other woodpeckers, slender, and keenly pointed. His eyes are very small, and twinkle like cut glass in the sunlight. His feet are those of a climber, and his tail-feathers are coarse and stiff.

The sap-sucker builds its nest far in the woods, where its season of incubation is passed in silence and abstinence from food, amounting almost to starvation. Its home is in a hole generally high up in a tree. Its food is sap or the juices of green trees. It eats nothing else. I have found it from Georgia to the region of the Northern lakes. The principal trees from which it obtains its food are the maples, hickories, cedar, apple, pear, Southern pine, and swamp-ash.

James Maurice Thompson.

REPENTANCE.

I.

He kissed me, and I knew 'twas wrong,
For he was neither kith nor kin.
Need one do penance very long
For such a tiny little sin?

II.

He pressed my hand. Now, that's not right.
Why will men have such wicked ways?
It didn't take a minute, quite,
And yet it seemed like days and days.

III.

There's mischief in the moon, I know
For I'm quite sure I saw her wink
When I requested him to go.
I meant it too—at least I think.

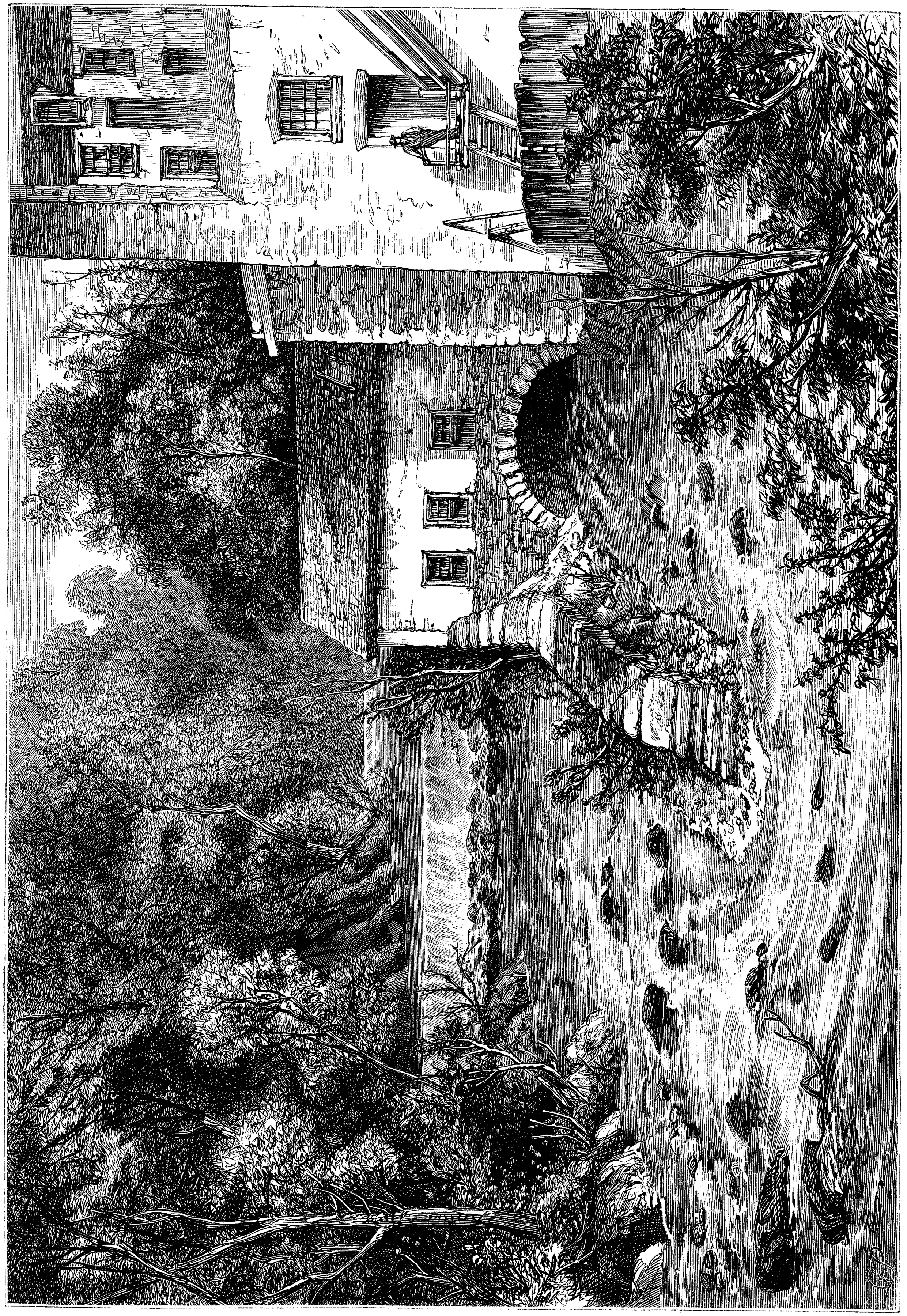
IV.

But, after all, I'm not to blame.
He snatched the kiss. I do think men
Are quite without all sense of shame.
I wonder if he'll come again?

C. C. E.

SCENE ON THE WISSAHICKON.

We gave in the Journal, No. 185, an illustration and a description of the Wissahickon, that wild and picturesque brook which runs into the Schuylkill near Philadelphia, in the heart of Fairmount Park. The many delightful pictures along the banks of this beautiful stream induce us to present the reader with a second view, representing not only the richly-wooded banks, but one of the many old mills that line its shores. Beautiful as the Wissahickon is, it has for many years done a vast useful labor, in "turning many a mill," on its way to the waters of the Delaware. These mills, fortunately, have not destroyed its charm—in many instances, indeed, adding a notable picturesque quaintness to the native wealth of beauty. Those within the boundaries of the park—which extends six miles along this stream—will probably be shortly removed, although a few only mar its attractions.



THE WISSAHICKON.

CONCERNING GIANTS.

THE fourth verse of the sixth chapter of Genesis, beginning, as we read in the authorized version, "There were giants in the earth in those days," has given rise to a deal of controversy among the learned. The Hebrew word *nephilim*, in this passage, which the Septuagint renders *giants* (γίγαντες), has received a variety of interpretations, Biblical commentators not agreeing on its derivation. Among the more plausible meanings ascribed to it are: 1. Giants in the common acceptation of the word, men of huge proportions of body; 2. Men surpassing in physical or mental strength; 3. Fallen men, apostates from the worship of the true God. Among the early Christian writers who favor the first of these opinions are Ambrose, Cassianus, and Theodoret. On the contrary, Chrysostom says: "I think that those in Scripture called giants are not any unusual kind of men for shape or feature, but such as were heroical, and strong and warlike." Cyril also writes: "It is the custom of Holy Writ to call wild, fierce, and robust men giants."

But it is not our object to discuss a philological question. Even if we are not to understand *nephilim* in this instance to mean giants in our sense of the word, there are other passages in the Old Testament which seem to point conclusively to the existence of men of huge dimensions in the early days of the world. The Rephaim, and their allied tribes, the Anakim, the Emim, and the Zuzim, are always described as giants. The sons of Anak, in particular, are said to have been "men of great stature," before whom the children of Israel were "as grasshoppers." Of the height of Og, King of Bashan, one of the last representatives of the giant race of the Rephaim, we are able to form some conjecture. His iron bedstead, which was preserved in Rabbath in the time of the author of Deuteronomy, was nine cubits in length and four in breadth. Calling the cubit eighteen inches, the bedstead was thirteen and a half feet long, and King Og must have been, if in proportion, more than twice the height of an average man of the present day.

The Eastern nations have many extravagant traditions concerning this giant. According to some of the Arabian historians, King Og excelled by far all other monsters that ever existed. He was so tall that he could reach the heavens. He had an unaccountable hatred of Noah, whom he continually sought to kill. But Noah proved too shrewd for him; for, whenever the giant pressed him closely, he withdrew into the caves of the mountains, where Og could not follow him. One day, in his rage at his numerous discomfitures, the giant plucked out his beard and threw it at his nimble enemy. Each hair at once became a cedar-tree, forming an immense forest that covered the whole plain, and from which Noah eventually cut the timber for the ark. Og survived the deluge by wading, the waters reaching no higher than his knees. The only inconvenience he experienced during the flood was that he was reduced to a fish-diet, his sole food during its continuance consisting of whales, which he roasted on the disk of the sun.

This is no more ridiculous than the stories told by the rabbins of Adam, whom, they say, God first created of a height so prodigious that his head reached the heavens. But the angels were so terrified at the sight, that God reduced him to a thousand feet high, or, according to others, a hundred. The latter estimate, however, is undoubtedly much too small; for, the father of the human race, when driven out of Paradise, waded through the ocean which separated this world from Eden.

Goliath, the Philistine of Gath, is supposed to have been another representative of the Rephaim, a remnant of that race having taken refuge with the Philistines after their overthrow. There appear to have been four brothers of this family, who were "born to the giant in Gath," all of whom were men of great stature. The names of but three are preserved, Goliath, Saph, and Lahmi. The fourth is said to have had twenty-four fingers and toes. The height of Goliath only is given. He was six cubits and a span, or about nine and a half feet high.

Passing over the fables of the giants and the Titans in classical mythology, which had their origin doubtless in terrestrial natural phenomena, many of them before our Aryan progenitors had left their Asian home, let us examine the numerous accounts of giants given by the Greek and Roman writers.

Herodotus says that, during the war between the Lacedæmonians and the Tegeans, the oracle at Delphi told the former that they would prevail over their enemies when they brought back to Sparta the bones of Orestes, the son of Agamemnon. Lichas went to Tegea and succeeded in securing them. They were found in a coffin seven cubits long, the body being of proportionate length. The father of history also records that Artaceas, a captain in the host of Xerxes, wanted but four fingers' breadth of five cubits, he being, with the exception of the king himself, the tallest man in the army. Xerxes then must have been at least seven and a quarter feet in height.

Arrian describes the Asians of Alexander's time as commonly of five cubits in stature, and avers that King Porus was of that height; but Suidas excels him by making Gauges, a giant slain by Alexander, ten cubits. Pausanias relates that, when the body of Ajax was exposed by the washing of the sea, the whirlbones (patellæ) of his knees were found to be as large as the quoits used by athletes. The same author says that the dead body of Asterius, King of Crete, was ten cubits long. Pliny tells of a giant named Gabbara, brought from Arabia in the reign of Claudius, who was over nine feet high; and of two others, Pusis and Secondilla by name, whose skeletons, nine and a half feet in length, were preserved in the Sallustian Gardens. According to Julius Capitolinus, the Emperor Maximinus exceeded eight feet. He used his wife's bracelets as rings, and could break the teeth of a horse with a blow of his fist. The Emperor Andronicus Comnenus, if we can put faith in Nicetas, was ten feet high. Nicephorus relates that, in the time of Theodosius, there was, in Syria, a man of five cubits and a hand's breadth. Florus says that King Theutobochus was of an extraordinary stature, higher even than the trophies; and Zonaras tells of a woman, in the time of Justin, who was two feet taller than women generally are.

But the ancient writers are not all so modest in their stories. Plato and Pliny are responsible for the account of the body of a giant, supposed to be Orion, found in a mountain in Crete, which measured forty-six cubits, or sixty-nine feet, in length; but, as Orion is generally said to have been buried in Delos, we are inclined to think that these two worthies were imposed upon. Plutarch, in his Life of Sertorius, tells a still larger story. Speaking of the city of Tingis, the modern Tangiers, in Mauritania, he says: "The Africans tell that Antæus was buried in this city, and Sertorius had the grave opened, doubting the story on account of the prodigious size; and, finding there his body, in effect, it is said, full sixty cubits long, he was infinitely astonished, offered sacrifice, heaped up the tomb again, gave his confirmation to the story, and added new honors tc the memory of Antæus." The body of a man ninety feet in height may well have excited his astonishment! Strabo, in giving a similar account, which he credits to Gabinius, slyly observes: "Gabinius, the Roman historian, indulges in relating marvellous stories of Mauritania."

In the time of the Emperor Hadrian, the body of the giant Ida, which measured twenty feet, is said to have been found. Eumachus records that the Carthaginians dug up two bodies, one of twenty-three and one of twenty-four cubits in length. Philostratus saw a body thirty cubits long, another of twenty-two, and a third of twelve. Trallianus, who lived in the sixth century, informs us that the Athenians dug up the body of Macrosyris, and found it one hundred cubits in length.

One would think this last story wonderful enough for the most imaginative mind; but it was reserved for the fourteenth century, and for the great Boccaccio, to hand down to posterity an account of the discovery of the remains of a giant that exceeded in dimensions all others that the world had seen. The following is a free translation of this remarkable production, which is well worth giving in full:

"It is by no means a fiction that giants have existed—that is, men exceeding others beyond measure in form or in stature. On the contrary, its truth is well established, and an accidental occurrence, in our day, at the town of Drepanum, in Sicily, has clearly demonstrated it. While some rustics were digging foundations for the construction of a sheep-house, at the foot of the mountains which overhang Drepanum, not far from the town, they came upon the mouth of a cavern, which, anxious to see what was within, they entered with blazing fagots. They found a cave of great height and size; and, walking to the end opposite the entrance, they saw, sitting down, a man of immense proportions, upon which, terrified, they took to flight, and ran out of the cave, nor did they stop until they reached the town, announcing to all they met what they had seen.

"The citizens, anxious to see what evil thing this was, lit wax-torches, and, having armed themselves, went out of the city in a body, as if against an enemy. More than three hundred of them went into the cave, and they saw no less than what the clowns had reported. At length, the foremost ones made known, after they found out that the man was not living, that he was sitting on a seat, and supporting himself with the left hand upon a staff of such height and size that it would exceed the mast of the largest ship. The man, also, was of an unseen and unheard-of height, in no part decayed or broken. When one of them, stretching out his hand, touched the standing mast, the staff fell from sight, dissolved in dust, and they saw another staff of lead, stripped of its covering, reaching even up to the hand of him who held it. And, when they had observed it attentively, they discovered that the lead had been run into the staff to increase its weight. Those who afterward saw it weighed assert that the lead was of the weight of fifteen Drepanensian cantarii, each one of which is of the weight of a hundred ordinary pounds.

"At length, the figure of the man, touched in like manner, dissolved, and fell almost all to dust—which, Aristotle also knew, happens to the dead, he saying somewhere: 'The bodies of the ancient dead, which suddenly turn to ashes in sepulchres, have lost all their substance, and retain their form alone.' When some felt with their hands this dust of the dead body of Drepanum, three teeth, yet solid, of monstrous size, were found, of the weight of three rotuti—that is, of a hundred ordinary ounces. The people of Drepanum, in testimony of the discovered giant, and for an eternal memorial to posterity, bound them with an iron band, and suspended them in a certain church of the city, founded in honor of the Annunciated Virgin, and inscribed with her title. They found, afterward, the anterior part of the skull, yet sound, of the capacity of many pecks; also the bone of one of the two legs, from which, although partly decayed on account of its excessive antiquity, it was calculated, by those who know the entire man from measuring the least bone, that he must have been of the height of two hundred cubits or more.

"It was surmised, by certain of the wiser ones, that this was Eryx, the son of Butes, the most powerful king of the place, and of Venus, who was buried in this mountain. Others believe that it was Entellus, who slew a bull in the funeral-games instituted by Æneas for his father Anchises. But others think it was one of the Cyclops, and especially Polyphemus."

Hakewill, in his curious "Apologie" (1630), mentioning the height of this giant, quaintly adds: "This is somewhat, I think, beyond Paul's steeple." Kircher ("Mundi Subterranei," Amsterdam, 1678), who saw the teeth, thinks they are those of a mastodon. He measured the cave, and found it to be less than thirty feet in height!

Other writers, of still later date than Boccaccio, give numerous accounts of wonderful giants. Holinshed, in his "Chronicles of England," devotes an entire chapter to the subject. He tells of a body, fifty feet in length, which was laid bare, in the year 1170, by the washing of the sea, on the coast of England; and of another, of fourteen feet, dug up in Wales, in 1087. In Perth, Scotland, one of fourteen feet was exhumed, "which to this day they show in a church." In 1475, says the same author, the body of Tulliola, the daughter of Cicero, was taken up and found to be "higher by not a few feet than the common sort of women living in those days."

Gervase of Tilbury saw, in the suburbs of Paris, the body of a man twenty feet long, "besides the head and necke, which was missing and not found, the owner having, peradventure, been beheaded for some notable trespasse committed in times past."

John Cassanion tells of the bones of Briat, found in Delphiny, that measured fifteen cubits; also of a giant of Bordeaux, a member of the body-guard of King Francis, who was so high that an ordinary man could go upright between his legs. According to Sir Thomas Elliot, a carcass was exhumed near Salisbury that was almost fourteen feet long. Julius Scaliger saw, in a hospital at Milan, a young man of so great a stature that he required the length of two common beds to lie upon. Goropius Becanus, physician to Mary, Queen of Hungary, says he saw a woman ten feet high, and that, within five miles of his dwelling, was to be seen a man of nearly the same height. Dalechamps, a French physician of the sixteenth century, asserts that a body of over eleven cubits in length was found in the bed of the river Orontes. Cælius Rhodiginus says that, in the reign of Louis XI. of France, the body of a giant, of stupendous magnitude, was dug up in Valentia, which, "judging from various pictures and from bones, would approach to eighteen feet." De Thou (Thuanus), in an account of an inroad of the Tartars into Hungary, in 1575, tells of a Tartar of great size, slain by a Pole, "whose forehead was twenty-four inches broad, and his body of such magnitude that, lying on the ground, it was as high as the navel of a man standing."

Hakewill devotes several chapters of his "Apologie" to a consideration of the subject of giants and their supposed remains. He says, quoting Melchior Nunnez, that, in the chief city of China, called "Paguin" (Pekin?), the porters are fifteen feet in height, and that the king entertains five hundred such men for archers of his guard. Odoricus Utinensis, in the account of his journey to India, asserts that he saw, in the court of the Great Cham, a giant of the height of twenty feet. Olaus Magnus, in his "History of the Northern Nations," tells of the body of a girl which was found, clad in a purple chlamys, that measured fifty cubits in length and four cubits across the shoulders. In telling so large a story, Olaus might at least have made the young lady of better proportions. His brother, John Magnus, Archbishop of Upsal, appeals equally to our credulity in his account of Rollo and Starchater, two giants of immense stature and of robust form, but their exact height he leaves to our imaginations.

Andrew Thevet, the famous voyager and cosmographer to Henry III. of France, in his description of America (Paris, 1575), says that he met a Spanish merchant, on the coast of Africa, who had come from South America. He had a coffer wherein he had preserved the bones of an American giant, who died in 1559, who, when living, was eleven feet and five inches in height. Thevet saw the skeleton and measured it, and exclaims: "A marvellous thing! to which I could scarcely have given credit if I had not seen it myself; inasmuch as the bones of the legs measured full three feet and four inches in length, and the skull was three feet and one inch about."

In 1684 Dr. Thomas Molyneux, F. R. S., read a paper before the Philosophical Society of London, in which he gave an account of a large human *os frontis*, preserved in the museum of the Medicine School at Leyden. He pronounces the bone to be human, without a doubt, and concludes that the man, if of corresponding proportions, must have been eleven or twelve feet high.

Diemerbroek, in his Anatomy, says that he saw in Utrecht, in 1665, a man eight feet and six inches in height, who was born in Schoonhoven, Holland, of parents of ordinary size. Ray mentions, in his Travels, that he saw the same man at Bruges. Charles Byrne, an Irishman, measured eight feet and four inches. He died in 1783, at the age of twenty-two. His skeleton, now in the College of Surgeons, London, is eight feet high. Edmond Malone, another Irishman, born in 1682, stood seven feet and seven inches with his shoes off; and Patrick Cottar, still another native of Hibernia, is said to have been of the enormous stature of eight feet seven and three-quarter inches. Walter Parsons, porter to King James I. of England, was seven feet seven. Maximilian Christian Miller, a native of Leipsic, who died in London in 1734, measured nearly eight feet. The brothers Knipe were each about seven feet two; and M. Louis, a Frenchman, was seven feet six. The latter had two sisters nearly as tall as he, and a brother who was taller. Miles Darden, born in Tennessee, in 1798, was seven feet and six inches in height.

Buffon gives a number of well-authenticated cases in which men have reached an extraordinary stature. The giant of Thoresby, England, was seven feet and five inches, English measure. A porter of the Duke of Würtemberg was seven and a half feet, Rhine measure. The giant Cajanus, of Finland, was eight Swedish feet in height, as was also a Swedish peasant. One of the guards of the Duke of Brunswick (Hanover) measured eight and a half Dutch feet. Gilli, a giant of Trente, in the Tyrol, was eight feet and two inches, Swedish; and a Swede, in the guard of the King of Prussia, stood eight feet six, also Swedish measurement.

But it is unnecessary to multiply individual examples. We will cite but one more case, that of the Patagonians, who have been represented to be a nation of giants. Hakewill says: "Ortelius describes a people whom hee tearmes Pentagones, from their huge stature, being ordinarily of five cubits long, which make seaven foote and an halfe." This is a truly ingenious derivation of the name. Pigafetta, who accompanied Magalhaens, gives their height in general as eight Spanish feet, which is equivalent to seven feet and four inches English. Commodore

Byron, who circumnavigated the globe in the last century, says that few of them are short of seven feet. The officers of the Spanish expedition to the Straits of Magalhaens, in 1785–'86, took accurate measurements of many of them, and found the common height to be from six and a half to seven feet. The tallest specimen measured seven feet and one and a quarter inches. The English officers, Philip Carteret and Samuel Wallis, say that, although some of them are from six and a half to seven feet in height, the greater part are from six to six and a half. Conceding even the latter stature, they are, says Prichard, the tallest race of men living; and it is not strange that wonderful stories were told of them by the early navigators.

St. Augustine says that "almost never have been wanting those who have much exceeded the ordinary stature." This is undoubtedly true. Giants, so called, have existed in all ages of the world, but we must not rashly accept the conclusion that the times of old produced any greater prodigies than the present. There is not, probably, a single well-authenticated case among those given by the ancient writers, of men whose stature has exceeded the natural limits, that has not been equalled or excelled within the last three centuries. The enormous skeletons found in times past, of twenty, thirty, fifty, and a hundred feet in length, were, without doubt, the fossil remains of animals of the primitive world, which nothing but ignorance could have ascribed to a human origin. Hakewill, after expressing a general belief in giants, adds: "Yet may wee suspect, the which Suetonius hath not spared to write, that the bones of huge beasts, or sea-monsters, both have and still do passe currant for the bones of gyants." A notable illustration of this may be drawn from the case of King Theutobochus. In 1613 it was reported that his grave had been discovered in Upper Burgundy. A brick tomb was found, it was said, thirty feet long, twelve feet broad, and eight feet high, bearing the inscription, "Theutobochus Rex." Within was a gigantic skeleton, twenty-five and a half feet in length, ten feet across the shoulders, and five feet from the breast-bone to the backbone. Some of the bones were carried to Paris and placed on exhibition. Both the pleasure-seeking and the scientific world were excited over the wonderful discovery; thousands flocked to see the sight, and the fortunate owner reaped a golden harvest. But one day a *savant*, who knew something more of anatomy than his fellows, announced that the skeleton of King Theutobochus was nothing more than a part of the fossil remains of an elephant. In so crude a state was the knowledge of science at the time that, even after this exposure, the owner is said to have taken the bones to other parts of the Continent and to England, and to have made a fortune from their exhibition.

In examining the claims of the giants of antiquity, we must take into consideration the fact that it was the custom of all the ancient nations to magnify the stature of their kings and heroes. To be considered a giant in strength and in size was the ambition of every warrior. Even the great Alexander was not free from this vanity, for we are told that, in one of his Asian expeditions, he caused to be made and left behind him a suit of armor of huge proportions, in order to induce a belief among the people he had conquered that he was of great stature. Homer exaggerates the size and strength of all the heroes of the Trojan War, and leads us to infer that the whole race of man, even in his day, had degenerated. We may suspect that even the Jewish writers were not entirely free from a similar failing. Admitting that a people like the Rephaim existed in Palestine, of greater stature than the Hebrews, it would require but a little stretch of a poetic imagination to paint them as giants. They may have been no larger in comparison with their conquerors than are the Patagonians beside other more civilized races of to-day, yet have seemed immense to the children of Israel, who were more probably under than over the average height.

Again, there is no absolute certainty that the Biblical text, as we have it, is as it was originally written. Our authorized version makes Goliath, for instance, six cubits and a span in height; but the Vatican copy of the Septuagint (Codex Vaticanus), as old as any in existence (unless the Sinaiticus exceeds it), reads "four cubits and a span," agreeing in this with Josephus. To which account are we to adhere? If to the latter, then the giant of the Philistines was only a little over six and a half feet in stature, instead of nine and a half. The sacred writer does not give us the measure of King Og, but only that of his bedstead. It is not necessary to dispute the thirteen and a half feet of the giant's couch, but we are half inclined to suspect that Og was afflicted with an ambition similar to that of Alexander, and used a bedstead not in proportion to his actual size, but in proportion to his fancied importance. It is curious to observe that, according to Dr. Smith, the words in Deuteronomy translated "bedstead of iron" are also susceptible of the rendering, "sarcophagus of black basalt;" but this does not militate against the probability of our supposition.

Comparatively modern writers are not free from like exaggerations in regard to the stature of noted men. William of Malmesbury makes the tomb of Walwin, nephew of King Arthur, and one of his famous knights, fourteen feet in length; and Holinshead, quoting Sylvester Giraldus, says that the body of King Arthur, found in Glastonbury, in 1189, was two feet higher than any man that came to see it. As Camden, who gives an account of the discovery, fails to note this peculiarity of the corpse, the story is probably without foundation. In like manner Charlemagne and his paladins have been represented as of great stature. Eginhard says that the great emperor was "seven of his own feet" in height; from which we must infer either that he had a very small foot, entirely out of proportion to his size, or that he was a very tall man. The old writers would have us believe, too, that Roland, the hero of Roncesvalles, was also of gigantic stature and strength. Happily, we have some direct evidence on this point. Hakewill, quoting Camerarius, says: "Francis I., King of France, who reigned aboute a hundred years since, being desirous to know the truth of those things which were commonly spread touching the strength and stature of Rouland, nephew to Charlemagne, caused his sepulchre to bee opened, wherein his bones and bow were found rotten, but his armour sound, though covered with rust, which the king, commanding to be scoured off, and putting it upon his owne body, found it so fit for him, as thereby it appeared that Rouland exceeded him little in bignesse and stature of body, though himselfe were not excessive tall or big." We have similar evidence in relation to the body of William the Conqueror, which was reported to have been dug up, four hundred years after burial, and found to be eight feet in length; for Stowe says that, when the English took Cannes, in 1562, some soldiers broke into the monument in search of booty, and found nothing remarkable about the bones.

Were it possible to get at the truth concerning the giants of antiquity, there is little doubt but that half of them could be shown to be pure myths, and that nine-tenths of the remainder could be reduced in size very materially. Pliny's assertion, that mankind is gradually degenerating, is wholly gratuitous, and has no foundation in fact. Indeed, a vast deal of proof can be adduced tending to show that the men of to-day are equal, and probably superior, in stature, to the ancients. The Greeks and Romans were undoubtedly of small size. The helmets and sword-hilts that have come down to us from the heroic ages could not be used by the majority of soldiers of the present European nations. Ancient rings also are generally too small for modern fingers.

But the classic writers give testimony enough on this point. Cæsar, speaking of the Gauls, says: "Our shortness of stature, in comparison with the great size of their bodies, is generally a subject of much contempt to the men of Gaul." Tacitus also describes the Germans as of robust form, and of great stature; and Strabo says that he had seen Britons at Rome who were a half a foot taller than the tallest Italians. Yet there is no proof that the men of these nations were any larger in ancient times than they are now. On the contrary, the graves and barrows tell a different story. The remains are usually under the average height of men of the present day. It is the same with the Egyptian mummies. According to Athenæus, a man of four cubits, or six feet, in height, was considered of "gigantic size" in Egypt. Apollodorus, the grammarian of Athens, gives the height of the "gigantic Hercules" as four cubits; and Phya, the woman who was selected to personate Minerva, at Athens, in the time of Pisistratus, on account of her great height, which was considered wonderful, did not exceed in stature four cubits less by three fingers, or only about five feet ten.

Numerous other examples might be given, but the facts cited are sufficient to prove that mankind at the present day, if no greater, is certainly no less in height, and in size than in the days of old; and that fully as many instances of abnormal stature have occurred in comparatively modern times as when "there were giants in the earth."

John D. Champlin, Jr.

HOW THEY WENT TO SCHOOL.

"A CURSE on these stupid letters! I swear by God's body I'd rather that my son should hang than study letters! For it becomes the sons of gentlemen to blow the horn nicely, to hunt skilfully, and elegantly carry and train a hawk. But the study of letters should be left to the sons of rustics."

That was the emphatically-expressed opinion of an English country-gentleman of the old school, whose ire had been aroused by some remarks in praise of learning uttered by his companions at a dinner-table nearly three hundred years ago. Having thus delivered his formal protest against the innovating spirit of progress that already began to shake the foundations of society, the tough old conservative "caught hold of a cup of wine" and "began to drink," probably coupling his draught with a sentiment: "Confusion to all book-learning!"

But while it is true that mediæval knighthood looked on the profession of letters as unbecoming a member of its order, and learning was held by the majority in light esteem, it is equally true that the greatest pains were taken in so educating the embryo chivalry of England that they should fill their allotted station in life with credit to themselves and their order. Though they knew nothing "of Aristotle and of his philosophy," leaving such matters to "clerks of Oxenford," who hoped to "getten them yet a benefice," they were taught how to "sit on horse, and fair ride;" to joust in the tilt-yard, and dance in the hall; to read love-romances, and write amorous ditties; to harp, pipe, and sing; to know the exact order of managing a household, and the degrees of rank and precedence; to serve the table, and to carve; and, if opportunity offered, to master the Latin and French tongues. Learning was of doubtful utility, if not a positive damage; but a perfect knowledge of courtesy, reduced as it was to a science, could not be dispensed with. The schools for the upper classes were therefore to be found in the houses of the great nobles, where the young scions of the nobility were sent to be taught "urbanitie and nourture."

The young gentlemen who were educated in these first-class boarding-schools had no easy life. During the first stage of their progress they were taught the rudiments of knowledge, so that they might be able to read the chronicles and romances for their masters and the ladies of the household when they grew older, and write French *sirventes* for their mistresses. Arithmetic was a study befitting only sordid merchants, or blear-eyed scholars who used it as a stepping-stone to the knowledge of geometry—then considered an occult science—and was beneath the notice of men of gentle blood. The plan of coaxing students on the road to knowledge had not then been discovered. The pupils were "pinched," and "bobbed," and "truly belashed," that they might progress on the painful path of study. Not only the teacher, but all their superiors in the household, kicked and cuffed the "yong enfantes" at will. The maxim of the Israelitish king, that has caused centuries of juvenile suffering, was then held in high honor, those having charge of the young being advised

"To their plaints give no great credence,
A rod reformeth all their insolence;
Who spareth the rod, all virtue setteth aside."

But the acquiring of the arts of reading, writing, and one or two languages, was but a subsidiary feature in the system of education, and not unfrequently was scanted or altogether omitted. The studies considered of real importance were those of arms and courtesy—how to behave in the field and in the hall. The military education was commenced by gymnastic exercises, running, leaping, and tilting at posts and pendent sand-bags. As the pupil grew older, he was mounted on horseback, and instructed in the management of his steed. To the tilting at posts and pendent objects were added tilting at the ring with the horse at full speed, and finally the joust, in which thrusts were taken as well as given. Then his education in arms was complete, and he was ready for knighthood and had the right to enter the lists at the tournament, or to take a post of honor and danger in the battle-field.

The art of courtesy covered every thing relating to the manners and morals of good society, from the proper posture at church to the exact manner in which a nobleman should wash his hands, and how the table-cloth should be shaken and folded. Several treatises serving as manuals of instruction on these points have come down to us, and they afford a curious picture of the inner life of the upper classes of the middle ages. Written as they were in different forms, and for the use of different households, there is so close a general resemblance as to prove that they reveal the general life of the age, and not of some isolated household. Whether books of courtesy, of urbanity, of the table, of nurture, or of carving, they all inculcate some general moral principles, give some instructions in the rules of common decency, and describe minutely the economy of the household, laying particular stress on the etiquette of the table. The youth is told to fear God, obey his superiors, and keep his nails clean. When standing before a superior, he must remain perfectly still, without spitting or sniffing. At table he is first to see that his hands are clean, and his knife sharp. If a person of higher rank sits near, to him should be given the privilege of first touching the meat. The point of this instruction will be seen when it is remembered that the English people were then not generally acquainted with

"The laudable use of forks,
Brought into custom here, as they are in Italy,
To the sparing of napkins."

The joint was grasped with one hand, while, with the other, armed with a sharp knife, a slice was cut off. The bread, set by the trencher, should, according to strict table etiquette, be split in two, the upper half being cut in four and then set together in one piece; the lower half cut in three and turned down on the others. Nothing should be eaten or drunk until the meats were brought in. Before touching the meats the nails should be clean, "lest thy fellow loathe thee." The pupil is told not to bite the bread and lay it down, for "that is no courtesy to use in town." The piece to be eaten should be broken off. Particular stress is laid on the injunction not to eat with the knife, which shows the antiquity of the struggle between etiquette and a common custom that any well-filled hotel-table will show has not yet been abolished. Minute directions are given in a matter that argues unfavorably of the general decency of the people. It was considered uncourteous to spit on the table or blow one's nose in the table-cloth or napkins, and the diner is strictly enjoined, should he have occasion to resemble the stevedores and teamsters of to-day in their contempt of such effeminate contrivances as pocket-handkerchiefs, to

"Look thy hand thou cleanse withal,
Privily with skirt do it away,
Or else through thy tippet that is so gay."

and it is "uncomely methinks" to take hold of the meat in carving with the same finger and thumb that had just grasped the nose, until they are cleaned. No doubt about that. Above all things, he is adjured—

"From blackness always keep thy nails."

In an age when the English were a more musical people than they or their kindred are now, singing and playing formed a necessary part of the page's education, and, as he grew up—

"Syngynge he was, or flowtynge, al the day."

The harp, flute, and pipe, were the instruments on which he was taught to practise. He was instructed how to sing ballads, part-songs, or to join in the church-chants, if need be.

At fourteen he passed from the condition of a page to that of a squire, and assumed a more responsible position. To the general instructions in good manners and the usages in good society were now added particular explanations as to the duties of the several members of a nobleman's household. Each young squire was appointed to fill a particular post, according to his birth and rank, the places of honor being those nearest the lord's person, and the highest rank being that of chief carver, a position generally filled by a son of the lord himself, like the "yong squyer" of Chaucer's "Canterbury Tales," of whom it is said—

"Courteous he was, lowly, and serviceable,
And carved before his father at the table."

Thus educated in all that pertained to arms and courtesy, trained to "set a squadron in the field," or to marshal a household in the castle-home, the young knight or noble completed his education and entered the world, perfect in the knowledge considered fitting for his station in life.

But, while the noble was being thus trained for the position to which the accident of birth called him, what was done with the knave? The sons of the rich and powerful were above book-learning—were the poor and humble permitted to acquire it? What chance it was intended they should have may be gleaned from the statute of Richard II., enacted A. D. 1388, in which it is ordained that "he or she, which used to labour at the plough or